very many cases it will hardly be necessary for the well-informed teacher to look up the reference in the body of the book. This book is not to be confused with the *Handbook of Practical Botany* "by Dr. E. Strasburger," which is the fifth English edition of a translation by Hillhouse of an earlier edition of *Das kleine botanische Practicum*. Some of the defects of this English edition, which bears Professor Strasburger's name, although it does not represent his views, were noted in the April (1902) number of the GAZETTE.—CHARLES J. CHAMBERLAIN.

THE LAST two parts of Wiesner's[3] *Die Rohstoffe des Pflanzenreiches* have just appeared from the press of Wilhelm Engelmann. This completes the second volume and the work, and is accompanied by title-pages and index. Unhappily the latter is in two parts, one containing the names of crude materials and the other the systematic names of the plants from which they are derived. The two should have been combined, so as to make only one place to look for any item. But a thorough index is such a boon, and one so often denied us by German authors, that we readily condone a superfluity. The present double *Lieferung* contains the conclusion of the twenty-third section on *fruits* (pp. 801–871), and, far out of its place, the rest of the seventh section on *woods* (pp. 872–1027) by Professor Dr. Karl Wilhelm. In this part a description is given of the woods of deciduous trees, both as to their general and microscopic characters, with remarks on the uses to which the wood is put. Over one hundred kinds are described, some including several species. Of ten or a dozen the botanical derivation is not known.—C. R. B.

THE FIRST number of *Annales Mycologici* under the editorship of H. Sydow, announced in the BOTANICAL GAZETTE for December, has appeared. It contains 96 pages, and the following list of contributors gives promise of a very strong journal: P. Dietel, H. and P. Sydow, P. A. Saccardo, A. von Jaczewski, C. Wehmer, F. Cavara, L. Matruchot, P. A. Dangeard, and J. Bresadola. It should be suggested to the editor that a table of contents would make the journal much more convenient for consultation.—J. M. C.

NOTES FOR STUDENTS.

MOLISCH finds[4] that the red color produced in the leaves of a number of species of Aloe when brought into open sunlight from the greenhouse is not due to anthocyan but to the red coloration of the chloroplasts themselves.

[3] WIESNER, JULIUS, Die Rohstoffe des Pflanzenreiches. Versuch technischer Rohstofflehre des Pflanzenreiches. Zweite gänzlich umgearbeitete und erweiterte Auflage. 11 und 12 Lieferung. 8vo. pp. 801–1071. *figs. 249–297*. Index to both volumes. Leipzig: Wilhelm Engelmann. 1903. *M* 10. (Two vols. unbound, *M* 60; bound *M* 66.)

[4] MOLISCH, H., Ueber vorübergehende Rothfärbungen der Chlorophyllkörner in Laubblättern. Ber. Deutsch. Bot. Gesells. **20**:442–448. 1902.

He finds red or red-brown chromoplasts also in seven species of Selaginella. The pigment proves to be a carotin.—C. R. B.

CENTROSOME-LIKE BODIES in the vegetative cells of the vascular cryptogams have been reinvestigated by Professor Němec.[5] The principal material was root-tips of *Blechnum braziliense*, *Diplazium pubescens*, *Dracaena arborea*, *Hibiscus calycinus*, and *Alnus glutinosa*. It was not difficult to find bodies which resembled centrosomes and would doubtless be interpreted as such by those who expect to find centrosomes in every cell. The writer comes to the conclusion, however, that there are no genuine centrosomes in the vegetative cells of the vascular plants, and unless blepharoplasts are centrosomes — and he believes they are not — that there are no centrosomes at all in vascular plants. The figures look like those which are familiar to any one who has made preparations of mitotic figures in root tips. Professor Němec states that with the same technique which he used for the root tips he was able to differentiate clearly the centrosomes of the liverworts.— CHARLES J. CHAMBERLAIN.

ONE MAY GET a very clear statement of Dangeard's[6] views on sexuality and related phenomena from a paper by him in *Le Botaniste*. Dangeard believes that the sexual act had its beginning through starved zoospores which fused with one another to satisfy this hunger. Sexuality was thus primarily autophagy. Parthenogenesis is to be expected whenever gametes find an environment sufficiently favorable for the vegetative activities common to all spores, *i. e.*, when taken out of their famished condition. These first principles form the basis of a discussion of reduction phenomena, the evolution and differentiation of sexual cells, a comparison of sexual processes in animals and plants, and other topics.

This is an interesting paper, presented in an attractive style. One must be cautious, however, in following Dangeard, for he deals with the most difficult field of speculative biology, where conditions are undoubtedly far more complex than is generally believed. — B. M. DAVIS.

RUHLAND[7] has made a preliminary report on the fertilization of some species of Peronospora and Sclerospora, and especially *Albugo Lepigoni*. The conditions in the latter are especially worth noting, since it adds a fifth form in Stevens's interesting series of four species in this genus (*Albugo Bliti*, *A. Portulacae*, *A. Tragopogonis*, and *A. candida*). *Albugo Lepigoni* has a very large coenocentrum and a much reduced receptive papilla, so that it stands at the *candida* end of the series. As a rule only one nucleus enters the ooplasm, taking its position near the coenocentrum, where it divides

[5] NĚMEC, B., Ueber centrosomähnliche Gebilde in vegetativen Zellen der Gefässpflanzen. Ber. Deutsch. Bot. Gesell. **19**: 301–310. *pl. 15*. 1901.

[6] DANGEARD, P. A., Théorie de la sexualité. Le Botaniste **6**: 263–290. 1898.

[7] RUHLAND, W. VON, Die Befruchtung von *Albugo Lepigoni* und einigen Peronosporeen. Hedwigia **41**: 179–180. 1902.

with a smaller nuclear figure than the previous mitoses in the oogonium. The evidence is not sufficient to justify the speculation that this is a reduction division. One of the daughter nuclei degenerates, the other becomes the female gamete nucleus and lies close to the coenocentrum, where it fuses with the male nucleus. The attraction of the coenocentrum for the gamete nuclei and its nourishing relations are especially evident.— B. M. DAVIS.

CZAPEK found in 1897[8] that a substance was present in geotropically stimulated roots which had a strong reducing action upon silver nitrate, and that in an unstimulated root there was less of it. He has now determined[9] that this substance is homogentisic acid, an oxidation product of tyrosin. The increase of homogentisin amounts at the maximum to 15 per cent., which is reached about the time the curvature begins to appear, from which time it falls off. (A similar phenomenon also occurs in phototropic organs on stimulation.) The zone in which it is found extends above the receptive zone to that of maximum growth. Czapek holds that his finding an increase of homogentisin in horizontally placed roots from which the terminal millimeter had been cut away excludes the strict form of Němec's hypothesis, that the starch-bearing cells of the root-cap *alone* constitute the perceptive organs for the geotropic stimulus. The accumulation of homogentisin in stimulated roots seems to be due to the temporary retardation of oxidative processes by special substances, soluble in water, insoluble in alcohol, and destroyed by heat. These Czapek suggests may be anti-enzymes, *e. g.* (anti-oxydase).—C. R. B.

ITEMS OF TAXONOMIC INTEREST are as follows: F. STEPHANI (Bull. Herb. Boiss. II. 3: 98–129. 1903), in continuation of his *Species Hepaticarum*, has described 20 new species of Plagiochila from tropical Asia and Oceanica, and 82 from the antarctic regions.—C. MEZ (*idem* 130–146) has described 22 new species of Bromeliaceae.— A. S. HITCHCOCK (Bureau Plant Industry, Bull. 33) has published a revision of the North American species of Leptochloa, recognizing 15 species and excluding *L. Brandegei* Vasey.— F. S. COLLINS (Rhodora 5: 1–31. *pls. 41–43*. 1903) has published a revision of North American Ulvaceae, recognizing 3 species in Ulva, 10 in Monostroma, 19 in Enteromorpha, and 1 in Ilea.— J. C. ARTHUR and E. W. D. HOLWAY (Bull. Lab. Nat. Hist. State Univ. Iowa 5: 311–334. *pls. 1–9*. 1902) in their fourth paper describing American Uredineae deal with the rusts inhabiting species of Agrostideae and Chlorideae, including 16 species, one of which is new.— W. A. MURRILL (Torreya 3: 7. 1903) has established a new family (*Xylophagaceae*) of the Basidiomycetes, based on *Xylophagus* Link and allied genera formerly included in Polyporaceae.—T. D. A. COCKERELL (*idem* 7–8) has described a new oak (*Q. Rydbergiana*) from New Mexico.—A. W. EVANS

[8] CZAPEK, F., Ueber einen Befund an geotropisch gereizten Wurzeln. Ber. Deutsch. Bot. Gesells. **15**: 516. 1897.

[9] *Idem* **20**: 464. 1902.

(Bull. Torr. Bot. Club **30**: 19–41. *pls 1–6.* 1903), in continuation of his "Hepaticae of Puerto Rico," has presented the genus Drepanolejeunea, including 10 species, and described 4 of them as new.—L. M. UNDERWOOD (*idem* 42–55), in publishing an index to the described species of Botrychium, has added 6 new species to the genus.—J. M. C.

THE REPRODUCTION of the interesting fungus Dipodascus, considered by some as one of the Hemiasci, is described by Juel[10] as follows: The sexual cells are multinucleate, the sexual nuclei being indistinguishable from the vegetative. After their union there is present a larger nucleus supposed to result from the fusion of two gamete nuclei. This fusion nucleus lies in the spore sac and gives rise to a large number of products which are much larger than the vegetative nuclei. The former become the centers of free spore formation and the latter remain with surplus cytoplasm in the sac. Juel regards Dipodascus as intermediate between the Phycomycetes and Ascomycetes. The spore sac is not homologous with an ascus but corresponds to a cell complex and consequently the form takes a low position in the series of Ascomycetes, near to but somewhat higher than Eremascus. There are lacking in Juel's investigation important stages in the nuclear history at the time of fertilization and during spore formation. These gaps make one hesitate to follow him in his views, and we are justified in asking for details on these points. It is not altogether clear that Dipodascus is an ascomycete. Perhaps it may be on a line by itself, with relationships somewhere among the molds. The sexual cells seem very close to coenogametes in spite of the fact that each is said to contain only one sexual nucleus, and spore formation in the sac, from Juel's account, does not seem like that in the typical ascus. Indeed, the spore sac suggests a germinating zygospore, perhaps exhibiting sporophytic tendencies which lead it to develop at once into a sporangium-like structure. These are some of the queries that present themselves.— B. M. DAVIS.

THE PHYLOGENY of the cormophytes, as indicated by their sporophylls and foliage leaves, is discussed in a long paper by Hallier.[11] The immense amount of detail and comparative morphology, especially in discussing the sporophyll, cannot be considered here, but a few of the conclusions and the principal features of the scheme of phylogeny may be of interest. Funiculus and integument correspond to a leaf pinna, on the upper side of which the megasporangium (nucellus) develops. The sporophyll of an angiosperm corresponds in general to the simple pinnate sporophyll of Cycas. In the Coniferales one, two, or more ovular pinnae are present, united congenitally by their edges. The staminate sporophylls of gymnosperms and angiosperms

[10] JUEL, H. O., Ueber Zellinhalt, Befruchtung und Sporenbildung bei Dipodascus. Flora **91**: 47–55. *pls. 7–8.* 1902.

[11] HALLIER, H., Beiträge zur Morphogenie der Sporophylle und des Trophophylls in Beziehung zur Phylogenie der Kormophyten. Jahrb. Hamburgischen Wiss. Anstalten **19**: 1–110. 1902.

are composed of two (seldom more) fertile pinnae and a sterile middle lobe, the latter being frequently suppressed. The typical staminate sporophyll of the angiosperms has come from the wedge-shaped or band-shaped sporophyll of the gymnosperms, Anonaceae, Magnoliaceae, Nymphaeaceae, etc. The sporophyte generation of the archegoniates is equivalent to the gametophyte generation, and has arisen from the gametophyte generation through the reduction of the sex organs. The archegoniates came from liverworts or algae, in which the two generations were equal in vegetative work and in which both generations had the dichotomous thallus. From this condition the sporophyte in the ferns advanced in its development, while in the mosses it degenerated and became dependent. All the Strobiliferae (cone-bearing pteridophytes and gymnosperms) have come from tree ferns of marattiaceous ancestry. The Gnetaceae are related to the Loranthaceae and Santalaceae; Ephedra, however, may be related to Casuarina and Myrothamnus. The Bennettitales are an extinct connecting link between the Cycadales and the Magnoliaceae. From the Magnoliaceae, directly or indirectly, come the rest of the dicotyledons, and also the monocotyledons, the latter coming from the region of the Ceratophyllaceae and Ranunculaceae.—CHARLES J. CHAMBERLAIN.

THE INFLUENCE of the nucleus upon the growth of the cell is described in a recent paper by Gerassimow.[12] The work is strongly supported by forty-seven tables which record the quantitative relations. Spirogyra was the plant used, and the conclusions depend upon a comparison of the behavior of nucleated and non-nucleated cells. Non-nucleated cells were obtained by disturbing the mitosis so as to move the nucleus from its central position toward one side; on the completion of the partition, one of the cells (in successful cases) would be left without a nucleus, although its chromatophores and other structures seem to be normal. As is known, Spirogyra divides late in the evening or at night, but division may be delayed until morning by lowering the temperature, the division taking place when the temperature is allowed to rise. The writer preferred to use material found dividing spontaneously. Such material was placed in a suitable vessel, surrounded by snow or crushed ice, and kept near the freezing point for about an hour, but was not allowed to freeze. It was then brought gradually to the room temperature. On the following morning many non-nucleate cells and chambers would be found. Although division may be induced by ether, this method was very little used. The following are some of the conclusions: The growth of a cell which has a superabundance of nuclear material is more vigorous than that of the ordinary uninucleate cell. The cell wall, the chromatophores, and apparently the protoplasm also grow more vigorously. Such cells divide only after they have reached a noticeably larger size. Non-

[12] GERASSIMOW, J. J., Ueber den Einfluss des Kerns auf das Wachsthum der Zelle. Bull. Soc. Imp. Nat. Moscow **1901**: 185–220. 47 tables and *2 pls.*

nucleate cells can grow somewhat in length. The non-nucleate chamber (which is distinguished from the non-nucleate cell by a larger or smaller opening in the partition separating it from its sister cell with the superabundance of nuclear material) grows more vigorously than the non-nucleate cell. Cells with a superabundance of nuclear material can conjugate with each other or with ordinary cells, and the size of the zygospore is in direct relation to the size of the conjugating cells.—CHARLES J. CHAMBERLAIN.

THE CONCLUSION of a paper by Matruchot and Molliard on the changes produced by freezing in the structure of plant cells, enables us to present a summary of their conclusions.[13]

The freezing of tissues always creates a demand for water at the exterior of the cell which produces a general and rapid outgo both of the water of the cell sap and the water of imbibition held by the protoplasm, resulting in a vacuolization of the latter, by which the cytoplasm becomes alveolar, and the nucleus a network of thick filaments and large meshes. The water once extracted from the plasma makes its way into the sap cavity either by simple osmosis, as is generally the case for the nucleus and probably for the cytoplasm, or by the bursting of the vacuoles and the escape of their contents outward, as in certain nuclei.

Exosmose of the water from the cytoplasm does not produce any easily observed structural modification. In the nucleus, however, the currents produced by the rapid exit of water in response to the demand from without, determino a uni-, bi-, or multipolar orientation of the nucleoplasmic framework, according as there are one or more directions of easy exit from the water. The "poles" are more watery and consequently less chromatic than the rest of the nucleus. They are always related in position to the sap cavity; the thinner the layer of protoplasm which separates the nucleus from the sap cavity the easier the exit and the more distinct the "pole." When very thin the wall of the nucleus may even be ruptured, letting the water escape bodily into the sap cavity.

The same alterations of structure as are produced in cytoplasm and nucleus by freezing can be produced by depriving them of water by other means, *e. g.*, by plasmolysis and by natural or artificial drying. The cytological evidence thus confirms Molisch's theory that death by freezing is in reality death by desiccation.

It will be evident at once that this paper has an important bearing upon certain cytological problems, since our modes of killing and fixing involve the relatively violent withdrawal of water, which the authors declare determines the orientation of nuclear material.—C. R. B.

SHIBATA[14] in an interesting preliminary paper records his experiments

[13] MATRUCHOT, L. and MOLLIARD, M., Modifications produites par le gel dans la structure des cellules végétales. Revue Gén. Bot. **14**: 401, 463, 522. 1902.

[14] SHIBATA, K., Experimentelle Studien über die Entwickelung des Endosperms bei Monotropa. (Vorläufige Mitteilung.) Biol. Centralbl. **22**: 705–714. 1902.

upon the structures of the embryo sac of *Monotropa uniflora*. Most of the observations were made upon material in the living condition. The interval between pollination and fertilization is dependent upon temperature. Under normal conditions fertilization takes place about five days after pollination, and on the same day or the next day from two to four cells are found in the endosperm. The fertilized egg elongates and bores its way into the nearest endosperm cell. Seeds ripen in about fifteen days after pollination, Light, atmospheric pressure, and mechanical injury of the ovule or other parts of the plant seem to exert no influence upon fertilization and subsequent phenomena, but the structures of the embryo sac are very sensitive to temperature. At 28° C. fertilization and subsequent phenomena proceed as at room temperature, and at 30° C. the endosperm nucleus can still divide; but at 31–32° C. fertilization can no longer take place, and disturbances are seen, due probably to increased osmotic pressure of the sac. By lowering the temperature the interval between pollination is lengthened, and at 8–10° C. fertilization is prevented. The experiments show that the polar nuclei may fuse in the absence of pollination, but that the fusion may be hastened or regulated by pollination; in normal cases the fusion occurs about five days after pollination, but when pollination is prevented, the interval may be prolonged to ten days or even longer. The three small antipodal cells disintegrate after fertilization, but when fertilization is prevented artificially, they may enlarge enormously and fill a considerable portion of the sac. At a temperature of 30° C. or higher there is no growth of the antipodals. Development of the endosperm can be induced experimentally in the absence of fertilization. When pollination is prevented, many of the ovules die within two or three weeks, but in others the sac enlarges and becomes filled with endosperm. In such cases the egg apparatus and often the antipodals collapse. This development of the endosperm was observed in 3 to 5 per cent. of the ovules, but at a temperature of 28° C., or by using osmotic solutions, endosperm was developed by 6 to 12 per cent. of the seeds. The writer believes that the endosperm nucleus has a stronger tendency toward parthenogenetic development than the egg. The full paper with plates will be awaited with interest.—C. J. CHAMBERLAIN.

IN THE January number of the *Revue Général de Botanique*, M. Luigi Macchiati announces his complete confirmation of the observation of Friedel (1901) that photosynthesis occurs *in vitro*, without the intervention of living protoplasm, by the action of an enzyme which utilizes the solar energy in the presence of chlorophyll. Several physiologists, including Macchiati and Friedel himself, repeated Friedel's earlier experiments with negative results. Now, however, Macchiati has obtained positive evidence, which he outlines, pending the publication of a more extended paper. Briefly his process and results are these:

Carefully washed leaves are extracted with equal parts of sterile distilled water and *c. p.* glycerin. The extract may be used or the enzyme obtained separately by shaking the extract with benzene, which is then decanted, carrying with it the enzyme, which settles as a flocculent amorphous precipitate. Other leaves, carefully washed, are dried at 100° C., powdered in a sterile glass mortar, and preserved in sterile glass with ground stopper. From the powder also the enzyme may be extracted, as it bears a heat of 100° for some time. Repeated extraction, washing, and drying frees it from the enzyme completely. The liquids to be tested were put into a beaker, in which is plunged an inverted funnel, having inverted over its stem a graduated test tube filled with liquid, into which the gases rise as they are set free.

Repeated experiments show that the glycerin extract from the living leaves or from the powder is unable alone to accomplish photosynthesis in light. On the contrary, the powder alone, if it contain the enzyme, when put into distilled water always causes an evolution of oxygen, and at the same time produces formaldehyde, the presence of the latter being demonstrable by the codein test. The enzyme is only able to produce photosynthesis in light if chlorophyll be present, which, as Friedel thought, seems to act as a sensitizer. The addition of an antiseptic, *e. g.*, $HgCl_2$ 1 : 2000, does not interfere with the process. CO_2 is absorbed from the air by the liquid in the beaker. The evolution of O is always proportional to the illumination. The leaves do not always yield the enzyme; they must be collected at a proper season.

These results seem not only to demand a new point of view regarding the nature of photosynthesis, but to furnish a new and strong support to Baeyer's hypothesis as to the process. At present the condensation of formaldehyde into a complex carbohydrate is not accounted for, nor do we know how a chemical sensitizer acts.—C. R. B.

THE PATH BROKEN by Jacobi (Flora **86** : 289–327. 1899) has been explored much farther by Treboux,[15] who agrees that even dilute doses of the stronger metallic poisons hinder photosynthesis in Elodea. Anesthetics and alkaloids act in the same way. Milder poisons such as KNO_3 exercise no very considerable influence until concentrated enough to plasmolyze the cell, when they permanently injure it. Acids, including carbonic acid, accelerate the evolution of oxygen in proportion to their concentration (within limits, of course). No evidence could be found for the formation of starch from formaldehyde, nor for any place for formaldehyde in photosynthesis. The Elodea used for these experiments, conducted in Leipzig, seems to have been a great deal more sensitive than the Chicago material (cf. the February number of the GAZETTE, p. 96).—E. B. COPELAND.

[15] TREBOUX, O., Einige stoffliche Einflüsse auf die Kohlensäureassimilation bei submersen Pflanzen. Flora **92** : 49–76. 1903.

A STUDY OF THE VEGETATION which has appeared upon Krakatoa since the destructive eruption of 1883 was made by Penzig[16] in 1897. The plants and their distribution he found in harmony with what could be expected from the report of the study made by Treub in 1886. The beach flora is the characteristic Pes-Caprae-formation of tropical islands, about twelve species composing it here. Beyond the beach, covering the lava hillocks and valleys, very tall grasses (*Gymnothrix elegans*, *Saccharum spontaneum*, and *Phragmites Roxburghii*) intermixed with vines (*Scaevola Koenigii*, *Ipomœa*, *Vigna*, etc.) predominate. Shrubs and other species are but isolated, so the vegetation may well be distinguished as a savanna. Above this, on the cliffs, ferns grow abundantly; while upon the more exposed rocks Cyanophyceae do the work performed in higher latitudes by lichens. In all 62 species (50 seed-plants and 12 vascular cryptogams) were found, as compared with 15 seed-plants and 11 ferns over ten years earlier. No mangrove trees grow about Krakatoa, nor as yet forest trees upon it. As to the means by which the island was seeded, it was learned that 60.39 per cent of the plants owe their arrival to ocean currents, 32.07 per cent. to the wind, and 7.57 per cent. to animals.—ETOILE B. SIMONS.

THE LIFE HISTORY of *Ruppia rostellata* is described in a recent paper by Murbeck.[17] It is suggested that pollination may take place under water as well as at the surface, although definite proof was not obtained. During the development of the microspores the tapetal cells break down, and their nuclei float free in the liquid which fills the cavity of the microsporangium. The formation of two definite male cells within the irregularly elongated pollen grain was traced in detail. A tapetal cell is formed, and the megaspore mother cell gives rise to four megaspores which are not arranged in a row, but the two lower spores lie one above the other while the two upper ones lie side by side or somewhat obliquely. This arrangement was observed in numerous instances. In one peculiar case the archesporial cell seems to have divided obliquely instead of by a pericline, and both resulting cells show the distinguishing characters of megaspore mother cells. In this mitosis, by which the archesporial cell gives rise to the tapetal cell and megaspore mother cell, the number of chromosomes was found to be sixteen. This number was also counted in other sporophytic cells. In the first division of the megaspore mother cell and also in the microspore mother cell the number is eight. The polar nuclei fuse completely before fertilization. Although the pollen tubes were traced to the embryo-sac, the actual process of fertilization was not observed. At the first division of the endosperm nucleus a wall is formed, dividing the sac into two chambers. The chamber at the

[16] PENZIG, O., Die Fortschritte der Flora des Krakatau. Ann. Jard. Bot. Buitenzorg **18**: 92–113. 1902.

[17] MURBECK, SV., Ueber die Embryologie von *Ruppia rostellata* Koch. Kongl. Svensk. Vetensk. Akad. Handl. **36**: 1–21. *pls. 1–3.* 1902.

antipodal end is small and its nucleus does not divide, but in the other chamber a large number of free nuclei are formed. A study of the embryo confirms the account of Wille that a primary root is formed at the base of the embryo, but soon disorganizes, and a lateral root, which is formed very early, is the first functional one. This is very different from the account of Ascherson in Engler and Prantl's *Die natürlichen Pflanzenfamilien*, and followed in Goebel's *Organography*, according to which this lateral root is the primary root, its unusual position being due to displacement.—CHARLES J. CHAMBERLAIN.

MISS SARGANT [18] has proposed a theory of the origin of monocotyledons based on her studies of seedlings of Liliaceae. The single cotyledon is regarded as being derived from two cotyledons by fusion. Among the large number of genera described, Anemarrhena is regarded as showing a primitive structure in the vascular strands of its seedling. The cotyledon of this plant shows two bundles with the xylem groups facing each other. This seedling is compared with that of the ranunculaceous genus Eranthis, in which the petioles of the two cotyledons are fused, forming a tube which contains two bundles; and the similarity is considered to be the result of inheritance from a common ancestor. Other genera of Liliaceae are described, forming series of increasing complexity, and the conclusion is reached that there is no true midrib in the cotyledons of this family. A consideration of other moncotyledonous seedlings follows, and the nature of the "monocotyledonous dicotyledons" is discussed, special reference being made to *Ranunculus Ficaria*, the single cotyledon of which is regarded as a fusion of two. Lists of dicotyledons with tubular cotyledons are given, and from the fact that practically all of these are geophilous plants she infers that the fused condition of the cotyledons in the monocotyledons has arisen in connection with the geophilous habit. — M. A. CHRYSLER.

TWO VERY interesting lichen-like associations of fungi with marine algae have been described by Minnie Reed.[19] She speaks of them as an Ulva-composite and a Prasiola-composite from the two algae concerned. The fungus in both instances is an ascomycete of the genus Guignardia, but the species are different.

Guignardia Ulvae n. sp. is associated with *ulva californica*, and the composite grows at "upper tide mark on the shady side of sandstone bowlders," at the entrance of the Bay of San Francisco. The Ulva-composite occurs in large and small patches, sometimes mixed with Ulva and Enteromorpha, and has been found at all seasons of the year with perithecia. The form of the plant suggests *Enteromorpha Linza*. Sections are striking because of the

[18] SARGANT, ETHEL, A theory of the origin of monocotyledons, founded on the structure of their seedlings. Annals of Botany **17**: 1–92. *pls. 1–7.* 1903.

[19] REED, MINNIE, Two new ascomycetous fungi parasitic on marine algae. Univ. Calif. Pub. Bot. **1**: 141–164. *pls. 15, 16.* 1902.

very large amount of the fungus. The algal cells are distributed singly or in groups, contained in capsules formed by a network of hyphae and in a gelatinous matrix. There is a central zone of mycelium so thick that the two layers of algal cells are widely separated. The perithecia are blackish swellings on the surface of the thallus, the cavity is lined with a pseudoparenchymatous layer from which the asci arise and there is a well-developed ostiole, lined with hairs that project outward. The ascospores are discharged in great numbers and germinate readily. It is probable that the germ tubes enter the Ulva sporeling at very early stages of development, and that they do not attack mature plants, for the latter have never been found partially infected. So the alga and fungus seem to develop together almost from the germination of the respective spores.

The Prasiola-composite came from Alaska. The fungus *Guignardia alaskana* n. sp. changes the character of the Prasiola plant (which is a new species, named *Prasiola borealis*), coloring it darker, and giving it a curled crinkled, and leathery texture in old plants. The monostromatic fronds become from 8–16 layers of cells thick after infection, and the algal cells are scattered very irregularly in the mass of mycelium. Another Prasiola-composite has been known for some years from the Antarctic, first described by Hooker (1845) under the name of *Mastodia tessellata*, its true nature being discovered by Hariot in 1882. The relation of the fungus to its algal host in these three composites is apparently essentially the same as in the lichens. The fungus must depend upon the alga for its organic material, and consequently operates as a parasite. Whether the alga gets any benefit from the association is very problematical. It is possible that the tougher texture of the frond may better resist wind and wave, but marine algae are generally well able to care for themselves in these respects and non-infected material grows successfully side by side with the composite plants.

It seems plain that these composite organisms are lichens, certainly as much so as is Ephebe, and we wonder if the author has special reasons for avoiding that name, and whether she thinks it should be replaced by a term indicating the dual nature of these plants.—B. M. DAVIS.